

Germplasm Conservation for Species Restoration: Examples From Efforts to Restore the American Chestnut¹

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American chestnut (*Castanea dentata*) was once a foundational species in much of its native range, especially in the Appalachian Mountains of the eastern United States. Unfortunately, the species was driven to functional extinction by the accidental importation of an exotic fungal pathogen (*Cryphonectria parasitica*), the causal agent of chestnut blight disease. Efforts to restore the American chestnut have been ongoing since the early 20th century and include three primary techniques: classical plant breeding, genetic modification, and reduction of fungal virulence.

While restoration of the American chestnut focuses primarily on incorporating disease resistance into a founding population, it has also facilitated the *ex situ* and *in situ* conservation of remnant populations. Conservation of American chestnut germplasm significantly increases genetic diversity and local adaptation among remaining populations, which in turn can contribute genes to disease resistant founder populations. Any plan to achieve complete species restoration in the long-term must also conserve diverse and locally adapted sources of American chestnut in the near-term.

Through a combination of traditional plant breeding methods, efforts of citizen scientists, and other means, preservation of genetic diversity of remaining American chestnut populations has become a priority for restoration work. Decades-long improvement programs have incorporated range-wide diversity and adaptations into the species' disease-resistant stock, developed germplasm conservation orchards and collections, and inventoried and monitored remaining wild individuals and small populations. With chestnut reintroduction trials now underway, the focus on understanding the diversity of the species, as well as the pathogen, has gained new momentum. Improvements in genomic technologies have provided new tools for assessing species diversity and guided restoration efforts.

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